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Community resilience for a 1.5 °C world

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Ten essentials are presented for community resilience initiatives in the context of achieving a 1.5 °C world: enhance adaptability; take account of shocks and stresses; work horizontally across issues; work vertically across social scales; aggressively reduce carbon emissions; build narratives about climate change; engage directly with futures; focus on climate disadvantage; focus on processes and pathways; and encourage transformations for resilience. Together the essentials highlight that resilience initiatives seeking to retain the status quo will be detrimental when they enable societies to cling to unsustainable activities. Instead, climate resilience initiatives need to be viewed more as a process of transformative social change, where learning, power, inequities and relationships matter. Finally, there is an urgent need for researchers to shift focus away from examining the nature of resilience to accelerating learning about fostering resilience in practice.

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Introduction

Keeping the world within the global goal of 1.5 °C rise in temperature requires rapidly reducing carbon emissions [1] through social and technological transformations [2]. Without such transformations, impacts of climate change will continue to accrue with major implications for humanity. Change is therefore inevitable, whether through attempts to steer societies away from high-carbon living and/or due to the growing impacts of climate change. This poses major challenges for place-based and interest-based communities, defined here as individuals connected by common values, norms and/or interests and sometimes a geographic place that shapes a shared sense of identity [3]. Such communities will need to navigate, adapt and respond to increasing shocks, stresses and new opportunities emerging from global environmental, social, economic and political change. In this context, the concept of resilience, which is often broadly defined as capacities to adapt to retain system functions, processes and feedbacks [4], is important for communities. Community resilience, however, is a contentious concept, often assumed in practice to be a process of 'bouncing back' to some kind of 'normal' after a crisis [5]. Yet, in a world of rapid change there is unlikely to be a normal to return to. Further, many attempts to enhance resilience can reinforce high carbon living and so will be detrimental over the long-term. Given that the 1.5 °C Paris Agreement and the Sustainable Development Goals (SDGs) directly seek to shape and create more equitable and sustainable futures, community resilience needs to be reframed as being more than sustaining what has already been, to being a forward-looking process of change that seeks to address a wide range of environmental and social issues [6].

There are thousands of research papers and books on resilience, several emphasising its relevance to achieving sustainability in the face of uncertainty [7,8]. However, very few have been written specifically in relation to a world of accelerating global and climate change. This paper draws on knowledge from disaster management, international development, community psychology, climate change and the collective experience of the authors to outline what is known about the key ingredients needed in community resilience initiatives attempting to stabilise global emissions at 1.5 °C relative to pre-industrial levels. The goal of the paper is not to add to the endless debate about what constitutes resilience nor to make specific distinctions between 1.5 °C and 2 °C targets. Instead, we present ten key 'essentials' (Table 1) that need to be embedded in community resilience initiatives if they are to engage seriously with addressing, and avoid enhancing, climate change. The paper is structured around these ten essentials illustrated with examples from three different continents. It concludes with a call for greater attention to systems and cross-scale approaches and for accelerating learning about resilience in practice.

Table 1

Ten essentials for effective community resilience initiatives in the context of climate change and a 1.5 °C world

Essentials
1. Enhance adaptability and flexibility for managing change and work with diverse resources and capacities;
2. Take account of shocks and stresses, direct and indirect impacts and anticipated and unanticipated change by enhancing specified and generalised resilience;
3. Work horizontally across sectors to avoid counter intuitive outcomes and to find novel solutions that simultaneously address multiple concerns;
4. Work vertically across social scales to ensure engagement in carbon reduction and to address issues of power, control and ensure support;
5. Reduce carbon emissions through transformative and proactive change;
6. Build narratives of climate change to enhance climate literacy and inspire hope and action;
7. Engage directly with futures to release creativity, imagination and change;
8. Focus on climate disadvantage and reducing inequities to overcome injustices of climate change and climate action;
9. Focus on processes and pathways through encouraging participation, learning and empowering forms of change.
10. Focus on transformative, rather than adjustment or reform kinds of change.

Ten essentials for community resilience to climate change

Enhance adaptability and flexibility through working with diverse capacities and resources

The first essential in designing community resilience initiatives for a 1.5 °C world is to focus on enhancing adaptability and flexibility. Adaptability relates to the diversity of response options available, such as diversity of sources of income that allows greater flexibility in responding to unanticipated change [9]. For example, development projects with more diversified services and resources are reported as being more resilient [10]. Adaptability also involves having capacities to take up response options, such as different skills and assets or the political capital that gives them credibility when transcending challenging periods of change [11]. Adaptability can be constrained by excessive emphasis on enhancing efficiencies: what may be considered to be redundant in one circumstance may provide new opportunities when a community is faced with unanticipated change [12]. Adaptability is also a human disposition, which can be subtly influenced by the context and conditions in which people reside. For example, communities faced with extensive social, political and environmental change can be more flexible and innovative [13]. How such capacities emerge and play out during periods of change, however, depends upon a range of critical legacies and socio-political conditions [11]. These capacities can be eroded through lack of consideration of the impacts of development interventions in communities (Box 1). Finally, adaptation can be associated with different kinds of change, with some adaptations being more transformative than others (see essential 10).

Enhancing adaptability involves working with diverse resources and capacities [14], including knowledge, skills, learning, networks, infrastructure, economic, and governance [15] as well as diverse forms of human, social, cultural, political, and spiritual capital [11,16–19]. Asset-based approaches that focus on working with and building on the resources currently available in communities are often advocated. There is also a particularly strong relationship between resilience and community cohesion, with the latter involving a sense of belonging (shared values, identity), feelings of inclusion (e.g. equal opportunities of access), effective participation, and a sense of recognition (including respecting and tolerating differences) [20]. Social cohesion is important because it can give rise to adaptive capacity and agency [16,21], such as enabling families to overcome periods of food shortage or illness [22]. While it is the combinations of assets that ultimately give rise to overall resilience [11], it is not always apparent which combinations will be most important. In the UK, for example, resources such as park wardens and libraries, which are at the frontline of cuts in local government, have been found to play an important role in promoting community resilience [23••]. Enhancing community resilience therefore needs to build on and retain a diversity of assets. Overall, adaptability is fundamental to, and even sometimes equated with, resilience [24] and needs to be nurtured and enhanced as a key part of community development activities.

Take account of shocks and stresses, direct and indirect impacts, and anticipated and unanticipated change

Impacts of climate change come in many forms, including immediate and localised 'shocks' (e.g. floods, droughts) and longer-term stresses (e.g. changes in food, energy prices, technology) [25•,26]. These can be both direct or indirect impacts, such as those arising from disruptions in other countries, to food and economies [25•]. Many shocks and stresses will be unanticipated. Initiatives therefore need to build both specified resilience to known shocks or stresses and broader generalised resilience to unanticipated change [27]. Generalised resilience is essential to help communities move out of unsustainable development pathways [27], such as incorporating carbon reduction strategies into resilience activities. Resilience initiatives therefore need to work across multiple and inter-related shocks and stresses, focus on their inter-relations, and work to address the underlying conditions that affect the extent to which people can adapt to them.

Box 1 Community resilience in Alaska

A target of a 1.5 °C world masks large global variation in temperature change, with high latitudes projected to experience much higher temperature rises compared to other parts of the world. Alaska has already warmed 1.7 °C in the last 60 years [70], exemplifying the challenges and consequences of failing to prevent large climate changes and need for enhancing resilience of Alaska indigenous communities to current and future change. Most cross-scale interactions between indigenous and western institutions have *reduced* community resilience by placing constraints on the timing and amounts of local harvest of fish and wildlife and by causing a shift from a semi-nomadic lifestyle (moving seasonally to access different food resources in different seasons) to permanent villages in a single location that enabled communities to meet new legal requirements for compulsory education. This has reduced adaptability and flexibility and has had counter intuitive impacts (essentials 1 and 3). These permanent villages were often built in flood-vulnerable locations where it was convenient to deliver materials for building schools.

A partnership of four communities, a regional tribal organisation, and the University of Alaska Fairbanks collaborated to address issues that communities identified as most threatening to their self-reliance and empowerment [71••]. All four communities identified integrity of their indigenous culture as their core goal (essential 7). Each community was already working towards this goal prior to engagement, and the collaboration served primarily to provide research, information or networking that facilitated community-selected goals and processes. Newtok is moving to a new location that will no longer be vulnerable to flooding and erosion associated with loss of sea ice during the season of autumn storms (essentials 2 and 3). Igiugig is integrating several forms of renewable energy into its power system to reduce their dependence on diesel fuel (essential 5). They have also built greenhouses to enhance food security at a time of climate impacts on the wild foods on which they historically depended (essentials 8 and 10). Koyukuk documented its flood history to support its requests to government agencies for climate-safe infrastructure (essentials 6 and 9). Nikolai engaged fishery agencies to negotiate new fishing practices that conserve climate-vulnerable salmon and the community's cultural and nutritional dependence on salmon (essentials 1 and 4). Actions by all four communities provide inspirational stories by which the world at large can learn about the importance of community actions that foster climate resilience and self-reliance (essential 6).

Climate-induced coastal erosion threatens Newtok.

Igiugig greenhouse to enhance resilience of food security

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Work horizontally across sectors and issues

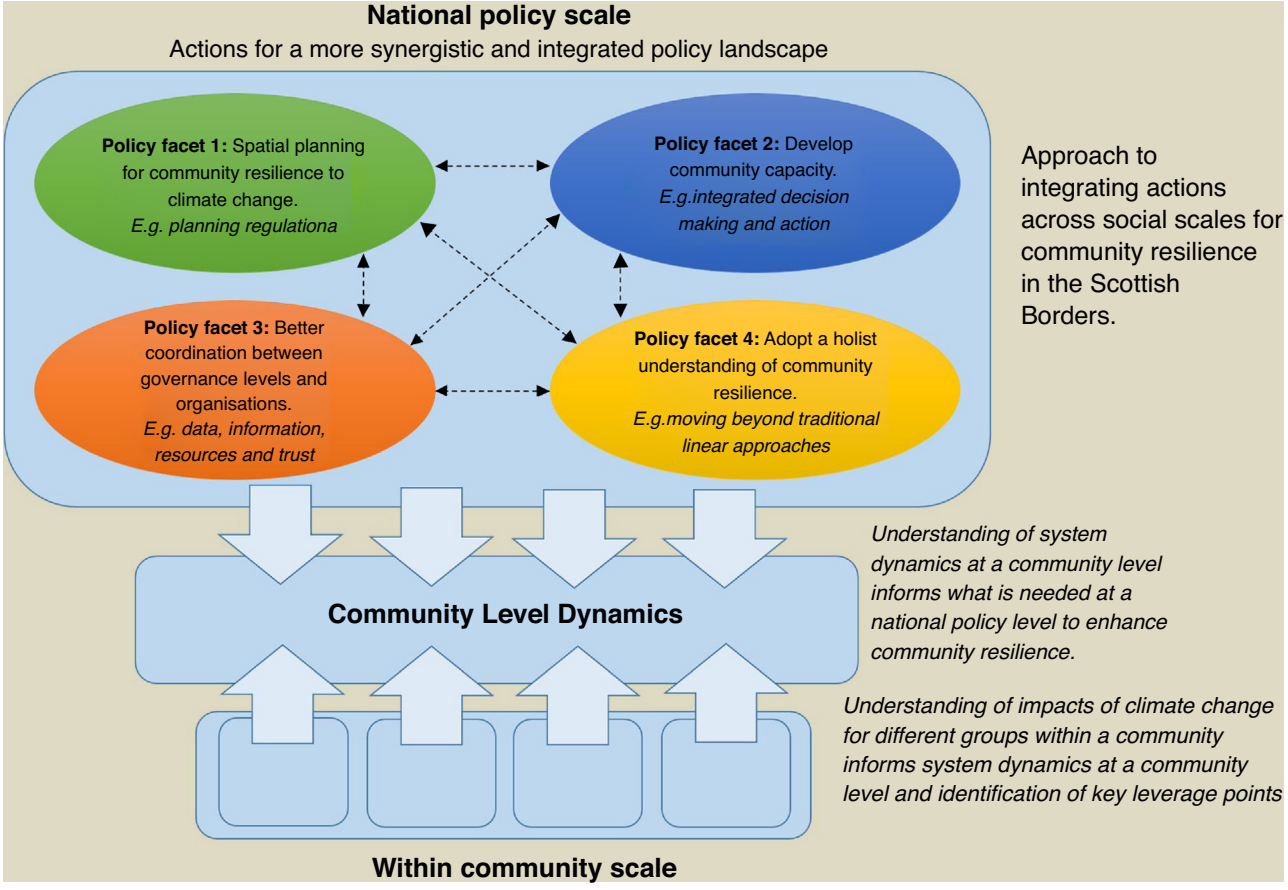
Climate change emerges from a wide range of cross-sectoral concerns. Solutions will only be found through systemic approaches that work horizontally across different sectors and which consider potential counter-intuitive effects of policies or interventions [28]. For example, flood defences can reduce perceptions of risk, lead to greater development on a floodplain, and ultimately increase actual risk to larger floods that penetrate flood defences [29]. Well intentioned development initiatives can also enhance exposure and reduce adaptive capacity (Box 1). Systems approaches that take a wider and more integrated perspective on a problem are therefore required. In the case of flooding this would involve wider catchment and natural flood management. Many activities, despite focusing on very specific objectives and operating from sectoral silos, however, are still invoked under the guise of resilience and in the absence of understanding of the wider systemic context and feedbacks, run the risk of exacerbating problems [30]. Care is

Box 2 Community resilience through working vertically across social and geographical scales in Scotland, UK

'Communities of place' are an important political focus for action to build resilience in the context of climate change. Community is not a simple social unit and instead includes diverse individuals, groups, issues and connections. Wider institutional structures and processes, such as national policies, often shape life within communities. Recognising this, the Scottish Borders Climate Resilient Communities action-research project sought to develop knowledge about the actions needed at three social and governance scales: within community groups; community level system dynamics and national policy landscapes [70].

The potential local consequences of climate change for groups of individuals *within communities* were explored through community level multi-stakeholder workshops that focused on five locally relevant issues influenced by climate change, such as food prices, energy and local weather. This uncovered, for example, interactions between health, housing, levels of financial capital, local businesses, built infrastructure and emergency responses. Through further analysis, system dynamics at a *community level* were then identified, which in turn enabled identification of integrated strategies to enhance resilience at a community level.

The *national policy environment* was then examined in ways that took into account the community level system dynamics and to establish how a more integrated, synergistic policy landscape could contribute to community resilience. 16 different ideas emerged from this process, clustered around four key policy facets: Spatial planning; developing community capacity; enhancing coordination of governance horizontally and vertically; and bringing about a more holistic understanding within practice of the concept of community resilience [70]. Overall, by examining dynamics operating at different social scales and taking account their interactions, it was possible to identify critical actions to help build community resilience in practice.


National policy scale
Actions for a more synergistic and integrated policy landscape
Policy facet 1: Spatial planning for community resilience to climate change. E.g. planning regulationa
Policy facet 2: Develop community capacity. E.g.integrated decision making and action
Policy facet 3: Better coordination between governance levels and organisations. E.g. data, information, resources and trust
Policy facet 4: Adopt a holist understanding of community resilience. E.g.moving beyond traditional linear approaches
Approach to integrating actions across social scales for community resilience in the Scottish Borders.
Community Level Dynamics
Understanding of system dynamics at a community level informs what is needed at a national policy level to enhance community resilience.
Understanding of impacts of climate change for different groups within a community informs system dynamics at a community level and identification of key leverage points
Within community scale

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therefore needed to ensure community resilience is framed in systemic, integrated and holistic ways that open up new thinking and possibilities rather than reinforcing existing ones.

Work vertically across social scales

What happens at one social scale has a bearing on other scales [31]. A resilient community depends on having resilient individuals as well as appropriate support from local or national governments [32]. For example, political systems and ideological orientations are highly influential in community resilience [33] and are critical in relation to climate change as many individuals may not by themselves choose to implement changes that benefit the community as a whole [32]. At the same time, however, individuals and families can affect what happens in communities, and communities can sometimes influence wider social scales [34]. Community resilience in the context of achieving 1.5 °C targets is therefore only likely to emerge from efforts that simultaneously work across different social scales [34] (Box 2).

Importantly, the concept of resilience itself has been suggested to reinforce and reproduce key ideological and political structures that operate at, and influence, different social scales [35,36]. For example, the concept has been suggested to privilege established social structures, which are often shaped by unequal power relations and injustice. These established structures then close off dialogue and opportunities about how they should themselves be transformed [35]. Much of the activity for resilience, for example, is driven by agencies external to communities (e.g. state agencies or non-government organisations for security, emergency planning, economic development) with emphasis being placed on what communities need to do to enhance resilience rather than questioning the underlying assumptions, policies, approaches of their own agencies and the influence or power their agencies have in affecting resilience at community levels [37]. The irony here is that any agency or organisation interested in enhancing resilience of communities to climate change may well need to first examine how the agency also needs to undergo change [37]. Such examination requires deep introspection, which is difficult for those working in large institutions struggling to work with limited financial resources and entrenched and dominant political, cultural or societal norms and ideologies. In summary, while initiatives for community resilience require engagement across different social scales, the greatest impact of change for resilience is likely to come from changes in the wider cultural and political spheres that influence community activities [38].

Reduce carbon emissions

Addressing the climate challenge ultimately demands rapid and major reductions in carbon emissions. Most resilience initiatives, however, tend to ignore mitigation and focus on adaptation when they are explicitly related to climate change. This not only avoids addressing a critical driver of change to which communities need to enhance resilience to, but can also result in adaptations that prop-up or reinforce unsustainable activities, postponing the levels of change needed that also reduce carbon emissions [39]. For example, many efforts by government and other agencies that claim to foster resilience are about keeping current systems going, such as road networks open, aeroplanes flying, people working and businesses operating. These well intentioned resilience activities are not necessarily wrong, but are based on implicit assumptions that resilience is about maintaining current modes of economic activity and economic growth, which in turn have been challenged in relation to their compatibility with effective climate mitigation strategies [40].

Many resilience initiatives thus focus primarily on addressing the symptoms of climate change (e.g. increased frequency or intensity of flooding or hurricanes) rather than underlying causes (e.g. high carbon economies). Yet historical evidence indicates that adaptations that seek to keep systems in their current form by focusing on symptoms rather than underlying causes result in more severe societal collapses [41]. As such, given that climate change is now one of the most pervasive drivers of global change, initiatives cannot genuinely be considered to be enhancing resilience unless they integrate mitigation into their activities. Community resilience initiatives therefore need to include aggressive carbon reduction efforts that meet or exceed politically agreed targets [42].

Build narratives about climate change

Climate change is still not a part of everyday conversation [43]. Encouraging conversations about climate change through resilience initiatives is thus critical for elevating the significance of the challenge and for building longer-term willingness for change for a 1.5 °C world. Some argue this needs to be done indirectly (e.g. by focusing on changes in the weather or specific shocks rather than more widely on climate change) while others suggest that more direct approaches are needed to work with synergistic aspects (e.g. to encourage inclusion of mitigation), albeit in ways that link climate issues to more tangible and immediate concerns [44••,45••].

Verbal and informal mechanisms are some of the most powerful means of transmitting messages on climate change [46,47]. Recent studies suggest that this is best achieved when issues directly relevant to communities are linked to climate change, such as on improving quality of life and the capacity of neighbourhoods to recover from threats and respond to change [48•]. Approaches that use a locality to help people connect to emotions and social meanings associated with climate impacts may be particularly fruitful [43,49]. Importantly, using creative public

participation methods can also engender positive emotions such as hope, responsibility, care, and solidarity, and thus potential to inspire action [50••]. While effective approaches may differ, there remains an urgent need to elevate climate conversations as part of everyday discussion, share stories about successes to inspire action (Box 1) and to bring the realities of climate change to the fore through locally relevant approaches that encourage agency for change.

Engage directly with futures

Climate change in the context of achieving 1.5 °C targets is challenging given that it requires significant and rapid societal shifts to avoid dangerous runaway climate change. This poses new challenges that require new approaches. While evidence from the past can help inform change, this can constrain imagination, creativity and possibilities for enacting change [51]. In contrast, enhancing community resilience requires conscious futures-oriented activities enabled through networks, behaviours, imagination, decisions, and collective action [52,53]. New approaches to help with this are emerging, such as in design [54] and futures methods like Three Horizons [53]. The latter helps shape dialogue around how to transform societal patterns and has been used in diverse contexts, such as rural development, transport, carbon pricing, education, and healthcare [53]. Overall, these approaches and others can enhance futures consciousness, agency and the co-creation of change [2].

Focus on climate disadvantage and reducing inequities

Community resilience emerges through complex social relations with different individuals and groups having different capacities and opportunities to respond to change. Not everyone is affected by climate change in the same way at the same time, with some being more disadvantaged than others. For example, a triple climate injustice exists where low income families tend to have lowest carbon emissions; are the most affected by climate impacts (e.g. in Scotland social housing has historically often been built on cheap land in the floodplain); and have least access to climate support (e.g. capital is needed to install solar panels to gain government renewable incentives) [55].

These inequities are reinforced by the way current social structures, relationships and political, social, economic and cultural conditions interact during periods of change [11]. For example, ability to recover from floods in Bangladesh was most limited for those who were marginalised by more powerful groups who could access resources. The marginalised groups were often exploited by middlemen who provided small loans that kept disadvantaged families locked in poverty [56]. Without attention to such wider social and political aspects, resilience initiatives (e.g. in this case providing microfinance) can inadvertently reduce adaptive capacities [57,58]. This highlights that resilience initiatives need to both involve developing understanding of the nature and dynamics of inequality as well as working actively towards reducing rather than reinforcing them, while keeping in mind that regimes of inequity will also be changing as the climate changes. As exemplified through work in Scotland, approaching resilience through the lens of climate disadvantage is one way to more directly link aspects of poverty and climate change and integrate different essentials (Box 3).

Focus on processes and pathways

Resilience is increasingly viewed less as an outcome and more as a process of engagement, action, and change [32], involving participation and empowerment through working with social relationships, strengthening institutions and working with human desires and capacities in a context where politics and power matter [48•,56,59]. In simple terms, 'participation' involves enhancing both ownership and responsibility for action through processes that motivate and address power imbalances that constrain participants of change [60,61]. Six organisational characteristics are important for empowerment, including: shared systems of ideas and beliefs (e.g. maintaining high expectations or common focus on using existing strengths); core activities that are meaningful; a supportive environment; opportunities for including diverse roles; inspirational leadership; and management that is flexible, open, learning-oriented and able to resolve conflicts [62]. Participatory approaches that are empowering involve balancing provision of support to avoid dependency and encouraging self-determinacy [63]. It is not always clear whether it is best to target resources to communities already engaged with projects or to those less engaged, where dependencies may emerge [10]. Importantly, appropriate attention to process provides opportunities for integrating the previous eight essentials in community resilience building, as highlighted in recent work in Australia (Box 4). Overall, initiatives need to approach resilience as a complex social process that requires continual navigation of different mindsets, needs and pathways of change.

Focus on transformative change

Communities across the world are currently far from resilient in relation to climate change, both in terms of their readiness to the growing impacts of a changing climate and in the extent to which engagement in actions to promote low carbon and more sustainable living is occurring. This highlights that community resilience to climate change, especially in more developed countries that produce the greatest amount of carbon emissions per capita, requires major shifts towards fundamentally new and more viable societal patterns. In short, a 'resilient community' in the sense of one that can 'bounce back' to some kind of normal in the context of climate change is currently not possible. This is because major deliberate transformative changes are first needed to shift communities towards radically different socially equitable and

Box 3 Community resilience through a climate disadvantage lens, Scottish Borders, UK

In the Scottish Borders (UK), villages and towns have often developed close to rivers, such as providing water-power for local industry and to support livelihoods. Following wider political and economic changes and growing impacts of climate change, many of these flood prone communities now face a complex mix of socio-ecological challenges. Drawing on capacities from multiple partner organisations, a transdisciplinary action-research project team worked with three communities in the Scottish Borders to facilitate action and learning for building community resilience in the context of climate change [70]. The project explicitly used a lens of climate disadvantage to guide a process of interactive, multi-stakeholder community workshops led by a full time project officer embedded within local institutions to facilitate collaborative practice (essential 9).

The deliberate framing around climate disadvantage helped open up multi-stakeholder discussions about the impacts of climate shocks and stresses (essential 2) and how these synergistically had far reaching consequences for some specific groups within communities and for communities as a whole. Using a climate disadvantage lens also emphasised the importance of understanding and developing practical solutions that focus on the relationships between issues with the potential to deliver multiple benefits at the community level, instead of relying on single issue solutions within traditional policy sector spheres (essential 3). In particular, the need to develop ways to build capacity within communities to organise and mobilise resources in the longer term was emphasised as a critical aspect of community resilience building.

In Scotland, supporting vulnerable people, reducing inequities and taking action to mitigate and adapt to climate change are key national policy goals. Sharing the local level insights about the systematic links between climate change and issues that help shape more generalised community resilience stimulated ideas from national level stakeholders on how to create more joined up policy environments to better support action to build resilience in the context of climate change across different communities (essential 4). Thus, applying a climate disadvantage lens provided the basis for integrating other essentials into the process of enhancing resilience, including: ensuring a focus on shocks and stress (essential 2), encouraging horizontal working across inter-related aspects of climate change (essential 3), revealing important vertical links across social scales (essential 4), and providing opportunities for widening understanding of climate change more broadly (essential 6).

Community meetings to examine climate disadvantage and flood damage in Hawick, a town built on the river to power mills for the textile industry.

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low carbon ways of living. Thus seeking to retain systems or communities as they currently are will be detrimental in the long term and an authentic climate resilience is really about a process of transformation.

A helpful way to think about this challenge is to consider the differences between the possible kinds of change that may be invoked under the guise of enhancing resilience. These types of change are adjustments, reforms or transformations and represent different adaptive responses to climate change (essential 1) [59,64]. Adjustments focus on increasing efficiencies, but do not change much of the social, economic or other aspects that ultimately constrain resilience. This may include enhancing the efficiency of

Box 4 Community resilience as a process in South East Queensland, Australia

The communities of the Logan-Albert river catchments in South East Queensland, Australia face multiple climate threats under 1.5 degrees (or higher) global warming. The region is becoming hotter and drier, suffering more intense storms, floods, and continuing sea level rise. The existing climate extremes increase pressure on already constrained resources, and extreme events such as droughts and floods endanger biodiversity, damage infrastructure, and threaten lives and livelihoods, often among already vulnerable people [70].

A participatory process that illustrates the 9th 'essential', to focus on processes and pathways, was developed to synthesise local people's knowledge to inform climate adaptation at the local scale where knowledge is scarce, and to connect community actors towards adaptive action [71••]. It covered a scenic and economically diverse rural area; a low income and highly multicultural urban area, the city of Logan, adjoining the state capital city of Brisbane; and the coast and islands of Moreton Bay, an important marine conservation area. All of these communities are rich in voluntary organisations, from environmental to social, religious and business foci, but these are not well connected. The office bearers of diverse community-based organisations were invited to participate in three local 'climate roundtables', and a fourth to join up the information and actors at regional scale (essential 4). The process included working with diverse community-based resources and capacities (essential 8), including the Indigenous Traditional Owners of each area.

Facilitator Susie Chapman with sea level rise diagram, Moreton Bay

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The process built on the participants' past experience of climatic shocks and stresses (essential 2) to suggest practical options that offer both specified and generalised resilience. A centrepiece of the process was creating systems diagrams for each climate threat. These traced pathways of influence across natural systems, built environments, economic, social and psychological processes, and included potential interventions and feedback loops (essential 3).

The project also focused on developing a sense of competence to address the future (essential 7). Participants were thinking ahead, identifying trends arising from multiple threats to wildlife, and the probability of climate refugees from the Pacific being attracted to the disadvantaged urban area, an existing centre of Pacific population. It focused on all social, economic and cultural sectors of civil society, including those experiencing socio-economic disadvantage and cultural marginalisation (essential 9). Opportunities lie in their unique ideas, such as strategies developed by the elderly to keep a bag packed and accessible at all times, whether for visiting grandchildren or escaping a flood. Overall, the example highlights how attention to process provides opportunities for linking the different essentials for community resilience for a 1.5 °C world.

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emergency responses or transport, which has an impact in the short term, but which ultimately cannot keep up with wider changes (e.g. growing impacts of climate change or increasing demand for mobility). Reforms may include wider policy, legislative or planning changes, such as changing patterns of housing at risk from flooding. Transformations are, however, much more fundamental deeper changes that affect the socio, cultural, political and structural conditions in which communities are embedded [59] and which begin to change existing community dynamics, relationships, and infrastructure, as well as contributing to wider shifts in worldviews and beliefs that underpin climate change [65]. Currently, in many agencies and sectors claiming to enhance resilience, the emphasis is on adjustments and sometimes reforms, but not on deeper transformations.

Unfortunately, there are no magic bullets for working towards transformations, which are usually highly contested and counter cultural. Transformations require: challenging the status quo [66]; engaging with power and normative aspects [67]; implementing innovations that produce significantly new patterns of viability [66,68]; and applying practices that unleash human potential, enhance creativity and promote wellbeing. As highlighted in essential 7, futures and creative endeavours are critical for helping identify visions for a transformed system and exploring potential pathways to move from the present condition to the desired future condition [53]. Thus deliberate transformations involve both preparations for transformation (e.g. identifying change agents and bridging among institutions) and then navigating the process through which transformation occurs [69]. Transformations are thus not easy and there is an urgent need to understand better about how they can be facilitated.

Conclusion

The ten essentials for community resilience highlight that in a context of rapid global change the practice of

community resilience needs to take a holistic and systemic approach that works with the complex interactions of multiple dimensions of climate change. This requires balancing the need for adaptations to maintain aspects essential for human wellbeing while also encouraging wider and deeper transformational changes towards low carbon and more socially equitable living. Transformative kinds of change are needed and, in the context of climate change, viewing resilience as 'bouncing back' is therefore misguided and will be detrimental over the long term if it enables communities to cling to unsustainable activities and social and political relations. Instead, initiatives are needed that view resilience as a complex social process of major change where learning, power, inequities and relationships matter and which lead to transformative changes towards more viable societal patterns. As highlighted by Boxes 1–4, resilience initiatives will need to engage with all of the 10 essentials to be genuinely successful in contributing to a 1.5 °C world.

Overall, the paper has drawn on current knowledge about resilience and translated this into a set of essentials to guide the design and implementation of forward looking resilience initiatives (Table 1). Importantly, however, the essentials do not provide specific insights about how to apply them in practice. While working with them is difficult, it is precisely through engaging with them together (e.g. Boxes 1, 3 and 4) that new opportunities will be found, such as the advantages gained from collaborative inter-agency working across diverse issues and finding solutions that simultaneously address multiple challenges. In this regard, research on resilience needs to take bold steps to move away from endless explorations about its meaning towards more direct engagement in understanding how to achieve it in practice. This will require action-oriented modes of research that can accelerate learning about fostering resilience and which contribute more directly to understanding how to achieve an equitable 1.5 °C world.

Conflict of interest

None.

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References and recommended reading

Papers of particular interest, published within the period of review, have been highlighted as:

- • of special interest
- •• of outstanding interest

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